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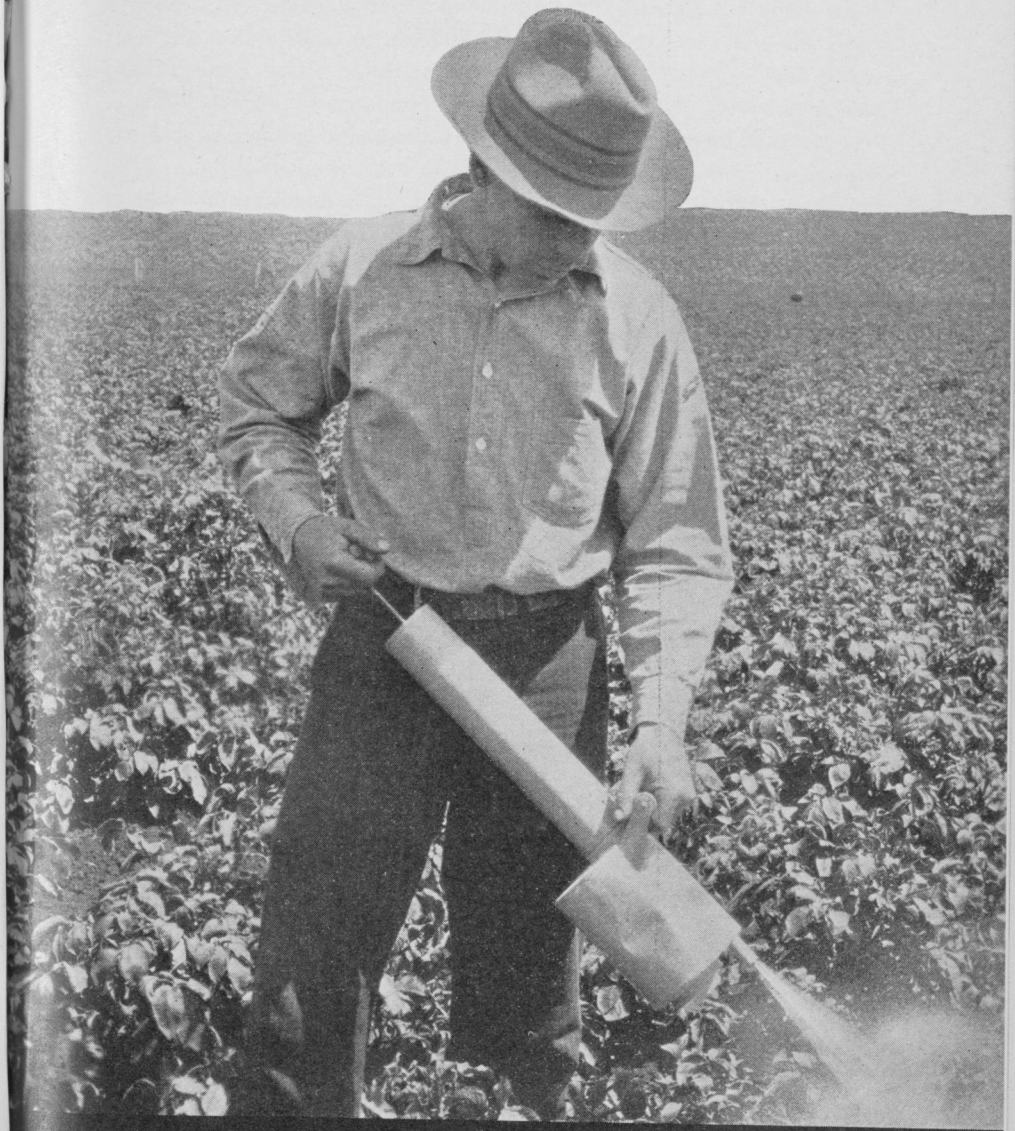

AGRICULTURAL EXPERIMENT STATION—AGRICULTURAL EXTENSION SERVICE, Cooperating
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Principal Potato Insects of Iowa and Their Control

H. C. Manis and H. Gunderson

There are a number of insects which attack potatoes in Iowa. The principal ones are the potato leafhopper *(Empoasca fabae* Harris), the potato flea beetle *(Epitrix cucumeris* Harris) and the Colorado potato beetle *(Leptinotarsa decemlineata* Say). These three species cause large economic losses yearly to potato growers unless the proper control measures are employed. Commercial growers have found that the control of the potato leafhopper alone frequently has increased the yield of potatoes by as much as 100 bushels per acre on large acreages.

LIFE HISTORY, HABITS AND INJURY

POTATO LEAFHOPPER

There is some question as to whether the potato leafhopper may successfully overwinter in Iowa or whether it flies up from the south in early spring. The adult (fig. 1) is a small, pale, yellowish green insect, about 1/8 inch long and very slender. It is broadest at the head end and gradually tapers to the tip of the wings. The hind legs are long and enable the insect to jump a considerable distance. The potato leafhopper is easily disturbed. When disturbed it will fly or jump to neighboring plants.

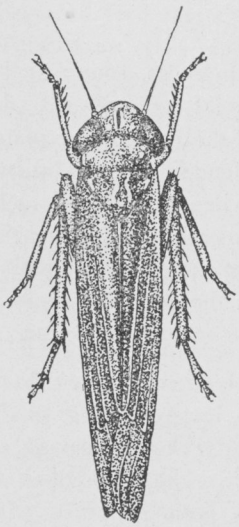

Fig. 1. Potato leafhopper. The adult insect. Enlarged about 15 times.

The first adults appear in potato fields during the latter half of May or first of June, depending upon the weather conditions. The females soon begin laying their small, whitish eggs in the tissues of the stems and midribs of the leaves. The eggs hatch in 10 to 15 days, depending upon the temperature. The small nymphs which hatch out are similar in shape to the adults but lack the wings, and they are very small and pale-colored so that they are quite hard to see. They usually

complete their growth on the leaf where they hatched and for the most part feed on the underside. They increase in size and greenishness as they develop. At the end of the fifth molt they become adults. The nymphs do not jump readily but usually run sidewise over the edge of the leaf to get away. They may complete their growth in from 1 to 4 weeks, depending upon the temperature. There are two generations a year with possibly a partial third. The adults and nymphs are most abundant during July and August.

Both adults and nymphs have sucking mouthparts and feed by inserting the beak into the plant tissue, which causes the margin of the leaf to turn yellow and then brown. The feeding activities of the potato leafhopper have been shown to be the primary cause of "hopper burn."

POTATO FLEA BEETLE

The potato flea beetle overwinters as an adult under leaves, grass or trash about the margin of the fields. The adult (fig. 2) is oval in shape, about 1/16 inch in length and nearly uniform black in color. The hind legs are distinctly thickened next to the body, enabling the beetles to jump readily when disturbed.

The adult beetles begin to appear in the field as soon as the potatoes are up, and the females shortly thereafter begin to deposit their small white eggs in the soil about the base of the plant. The eggs soon hatch, and the delicate, slender, whitish worms which are from 1/8 to 1/3 inch in length when full grown, with small legs and brown heads, feed on the roots and tubers of the plant. Pupation usually occurs in the soil, and there is generally only one generation a year.

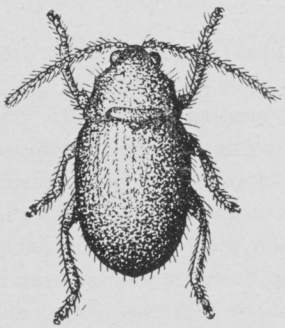

Fig. 2. Potato flea beetle. Adult insect, enlarged 24 times.

The adults have chewing mouthparts and feed on the leaves, eating small, rounded or irregular holes through or into the leaf, so that the leaves look as though they had been peppered with very fine shot. When flea beetles are very abundant the leaves may become so badly eaten that the plant will die.

COLORADO POTATO BEETLE

The Colorado potato beetle or common "potato bug" is perhaps the best known of all the insects attacking potatoes. This beetle overwinters as an adult in the soil at a depth of several inches. The adults come out of the soil, sometimes even before the potatoes are up and feed on weeds in the fields. These adults are easily recognized by the alternate black and yellow strips that run lengthwise of the wing covers (fig. 3). They are about 3/8 inch long by 1/4 inch wide and quite rounded on top. The females very early begin to lay their orange-yellow eggs, usually on the underside of the leaves, in close-standing groups averaging a couple of dozen each. In about a week the eggs hatch, and the small, humpbacked, reddish, chewing larvae begin to feed upon the leaves. They grow very rapidly and molt four times. The full-grown larva is about 1/2 inch long with an arched back and two rows of black spots on each side of the body (fig. 4). When full grown the larvae drop to the ground, burrow into the soil and pupate. The pupal stage lasts from 5 to 10 days, and then the adult beetles appear from the pupae, crawl out of the ground and after feeding for a few days begin laying their eggs for the second generation. There are two generations a year.

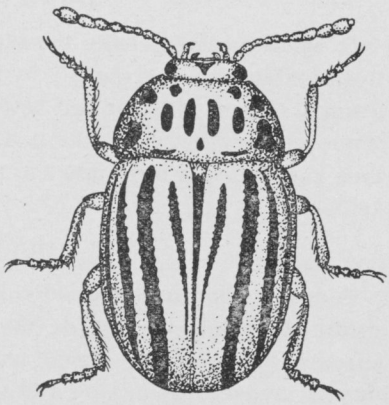

Fig. 3. Colorado potato beetle. Adult beetle, enlarged three times.

Both the adults and the larvae have chewing mouthparts and feed upon the leaves of the plant. The greatest amount of damage is done by the larvae, which usually feed in groups, completely consuming the leaves. When there is a heavy infestation the plant may be completely defoliated, although complete defoliation is not necessary to cause great reduction in yield.

Fig. 4. Colorado potato beetle. Mature larva, enlarged three times.

CONTROL MEASURES

CULTURAL METHODS

The margins of the field and all fence rows should be kept free of weeds, leaves and other debris in order to do away with the hibernating quarters of the potato flea beetle.

HAND PICKING

In small garden patches the Colorado potato beetle may be controlled effectively and cheaply by hand picking. A bucket containing a small amount of water and kerosene and a wooden paddle can be employed very efficiently, the paddle being used to strike the plant, thus knocking the bugs into the pail, where they are killed by the kerosene.

DUSTING

A new method has been developed at Iowa State College for the control of potato insects. It has been found that sulfur dust is as effective against these insects as 4-4-50 bordeaux mixture. This dust is prepared by mixing 100 pounds of 325-mesh dusting sulfur with 8 pounds of calcium arsenate. Apply with a power or hand duster at the rate of 25 pounds to the acre. The cost of the material for dusting is about $4 per hundred, which would make the cost of material and labor of putting it on about $1.20 per acre for one dusting. This dust should be applied while the air is still and there is considerable dew on the plants. Applications should be made at 10 to 12-day intervals.

Since dusts are cheap and easy to apply with low-cost equipment, this method of control is particularly well adapted to the needs of the small grower.

SPRAYING

Where spraying equipment is available and the grower prefers, he may control most of the common insects attacking potatoes by the use of 4-4-50 bordeaux mixture to which has been added 1 pound of calcium arsenate or paris green.[1]

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[1]This method for controlling potato leafhoppers was originally developed by E. A. Fenton and Albert Hartzell. Complete information may be obtained from Iowa Agr. Exp. Sta., Res. Bul. 78, 1923.

Formula for making 4-4-50 bordeaux mixture:

	Field Formula	*Garden Formula*
Hydrated lime	4 pounds	4 ounces
Pure copper sulfate (bluestone)	4 pounds	4 ounces
Water (cold)	50 gallons	3 gallons

For controlling chewing insects the above mixture is poisoned by adding:

Calcium arsenate	1 pound	1 ounce
or		
Paris green	1 pound	1 ounce

A quick method of preparing a bordeaux mixture at home is as follows: Put 4 pounds of powdered bluestone into the strainer on the sprayer, wash it through with 25 gallons of water, start the agitator and pour a milk of lime into the strainer, washing it through with 25 gallons of water. The milk of lime is previously prepared by mixing 4 pounds of lime with some water in a big bucket. If calcium arsenate or paris green is used, it is added to the lime at the rate of 1 pound for 50 gallons of spray.[2]

Fig. 5. Modern power sprayer applying bordeaux mixture and arsenate to potatoes.

First dissolve the copper sulfate in a small amount of water in a separate container. Then do the same with the lime in another container. When ready to spray pour the two solutions into the spray tank and then add water up to the required amount. When this is thoroughly stirred add the paris green or calcium arsen-

[2]Fitch, C. L. 20 rules for potato growing in Iowa. Iowa Agr. Ext. Ser., Cir. 254. 1939.

ate and again mix thoroughly. This mixture should not be allowed to stand but should be sprayed on the plants immediately.

In small gardens, a powdered, prepared bordeaux mixture may well be substituted for the homemade mixture. Most commercial, dry bordeaux mixtures are used with water at the rate of 1 package of prepared bordeaux to 12½ gallons of water. One-half pound of calcium arsenate or paris green should be added to this formula to control chewing insects.

Good results are obtained by spraying with a pressure sprayer exerting 150 to 200 pounds pressure, although commercial growers find 300 to 400 pounds pressure more satisfactory. Spray nozzles should be so directed as to spray the underside of the leaves. Such a sprayer is shown in operation in fig. 5. Begin spraying as soon as the first leafhoppers appear and repeat at 10 to 12-day intervals. Apply at the rate of 100 gallons of spray per acre.

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